# Lithological control on the spatial evolution of fault slip on the Longitudinal Valley Fault, Taiwan - Supplementary materials

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## S.1 Seismicity

The Longitudinal Valley Fault (LVF) is known to creep near the surface (Angelier et al., 1997; Lee et al., 1998, 2000, 2001, 2005; Chang et al., 2009; Peyret et al., 2011; Champenois et al., 2012) but has also produced large earthquakes, with $M_w > 6.8$ events in 1938, 1951 and 2003 (Fig. S.1). The 2003 Chenkung earthquake and the 1951 earthquake sequence are of particular interest since field studies and geodetic analysis have demonstrated that both events have ruptured the aseismic section of the LVF (e.g., Wu et al., 2006; Shyu et al., 2007; Chung et al., 2008; Lee et al., 2008; Mozziconacci et al., 2009; Hsu et al., 2009; Thomas et al., 2014). Those studies have also shown that no significant slip near the surface have been inferred, where the fault is creeping, which supports the hypothesis that the partitioning between aseismic and seismic slip influence the spatial extent of earthquake ruptures (e.g., Kaneko et al., 2010).

Based on the background seismicity, Chung et al. (2008) have suggested that the LVF can be divided into three zones form north to south (Fig. S.1). In the northern section numerous M5 and M6 events have been recorded, with a mix of normal, strike-slip and thrust focal mechanisms, which are likely related to the Ryukyu subduction (Kuochen et al., 2004). The central zone display a seismic gap with only few earthquakes occurring at depth less than $\sim$ 20 km. The southernmost section on the contrary records more events, predominantly with thrust focal mechanisms.

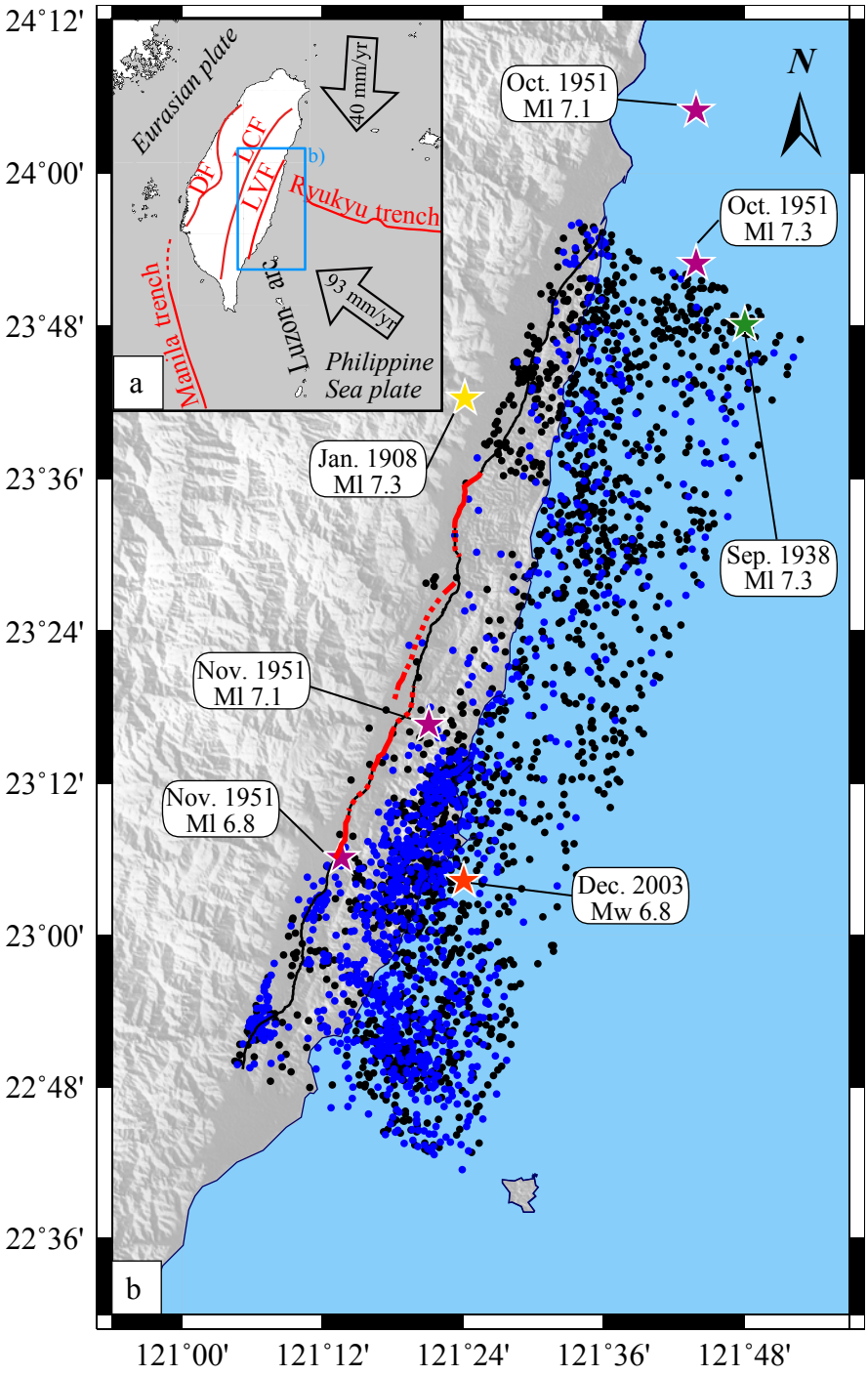


Figure S1: (a) Regional tectonic setting of the Longitudinal Valley Fault. (b) Seismicity around the LVF from 1991 to 2010. The selected region is based on the assumption that the LVF has a gobal strike of the fault (N20°), is dipping eastward and extending downward to a depth of 30 km. Blue dots represents the $M_w > 3$ seismic events recorded since the Chengkung earthquake (12/10/2003) until December 2010. Blacks dots represent the $M_w > 3$ seismicity recorded from January 1991 to the day before the Chengkung earthquake (Wu et al., 2008). Yellow, green, red and purple stars indicate the epicenter of the 1908, 1938 and 2003 earthquakes, and the 1951 earthquakes sequence, respectively (Chung et al., 2008). Shyu et al. (2007) estimate of the extent of the November 1951 ruptures is shown in red (the dashed line are inferred).

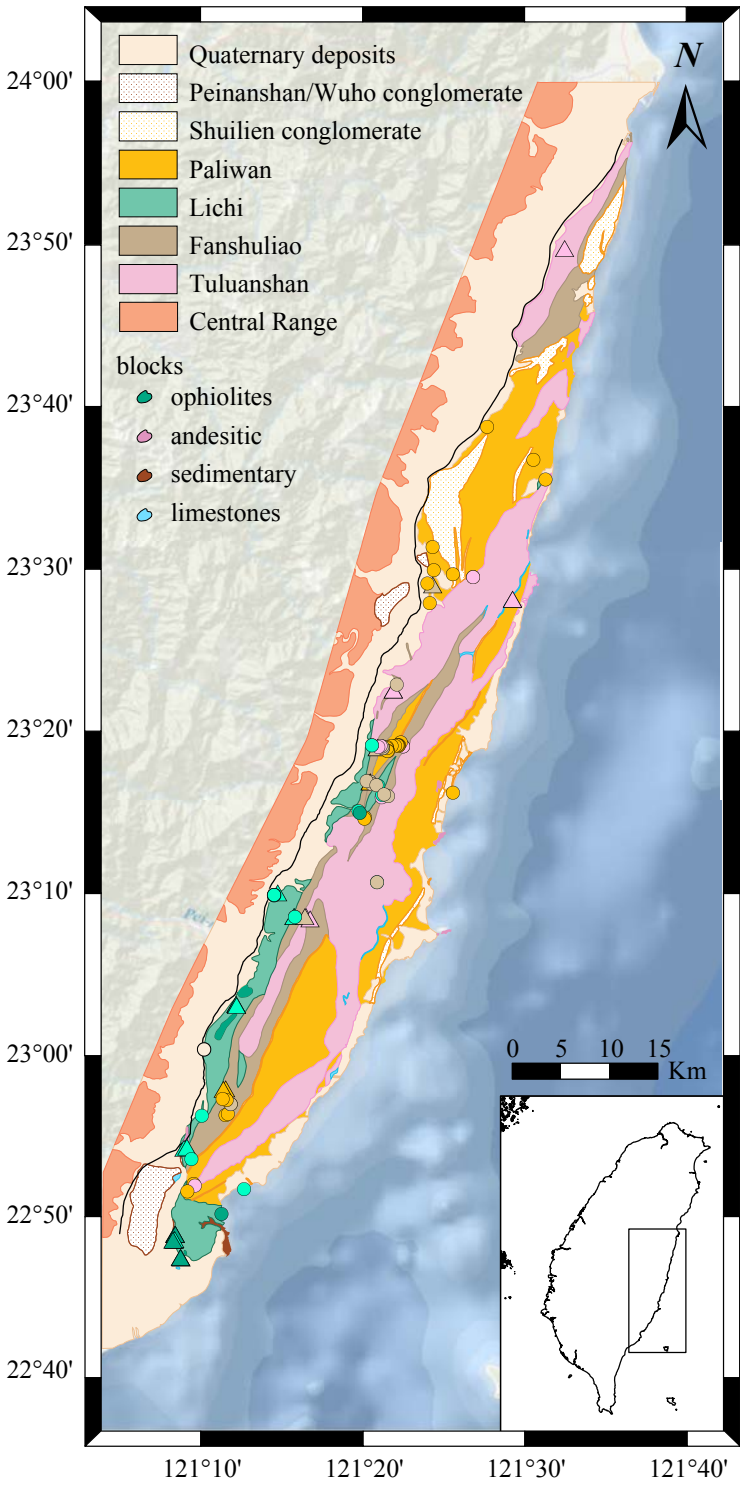


Figure S2: Geological map of eastern Taiwan (modified from Y. Wang and W.S Chen, 1993) and the locations of samples collected in the field. Circles are samples collected in September 2012, while triangles give the locations for the April 2010 sampling survey. Color attributions for samples and lithological formations are identical.

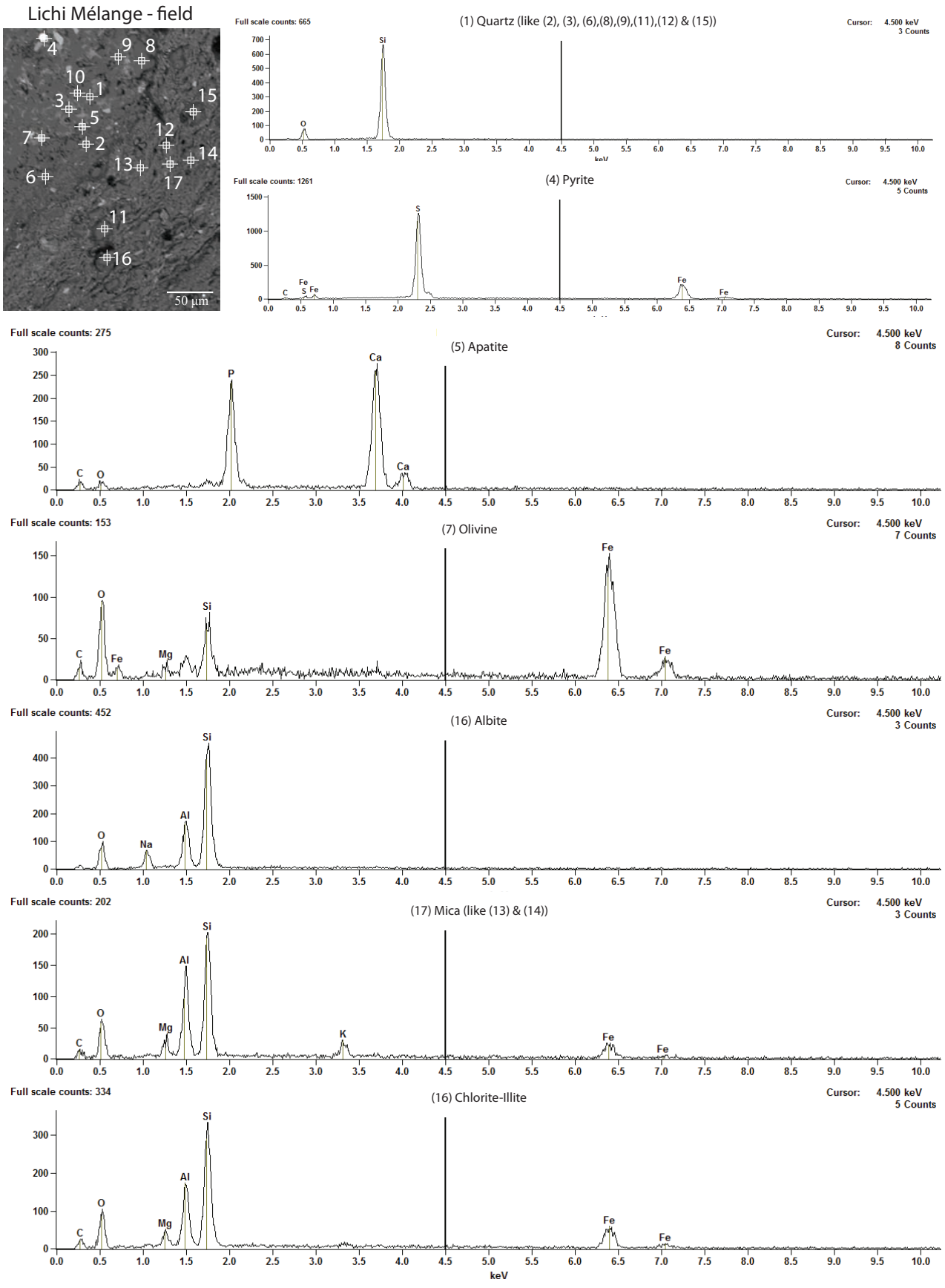


Figure S3: Representative EDS traces of grains inside the fault gouge, sample lvf4 (Lichi Mélange). For location of the analysis, see Figure 3.3e.

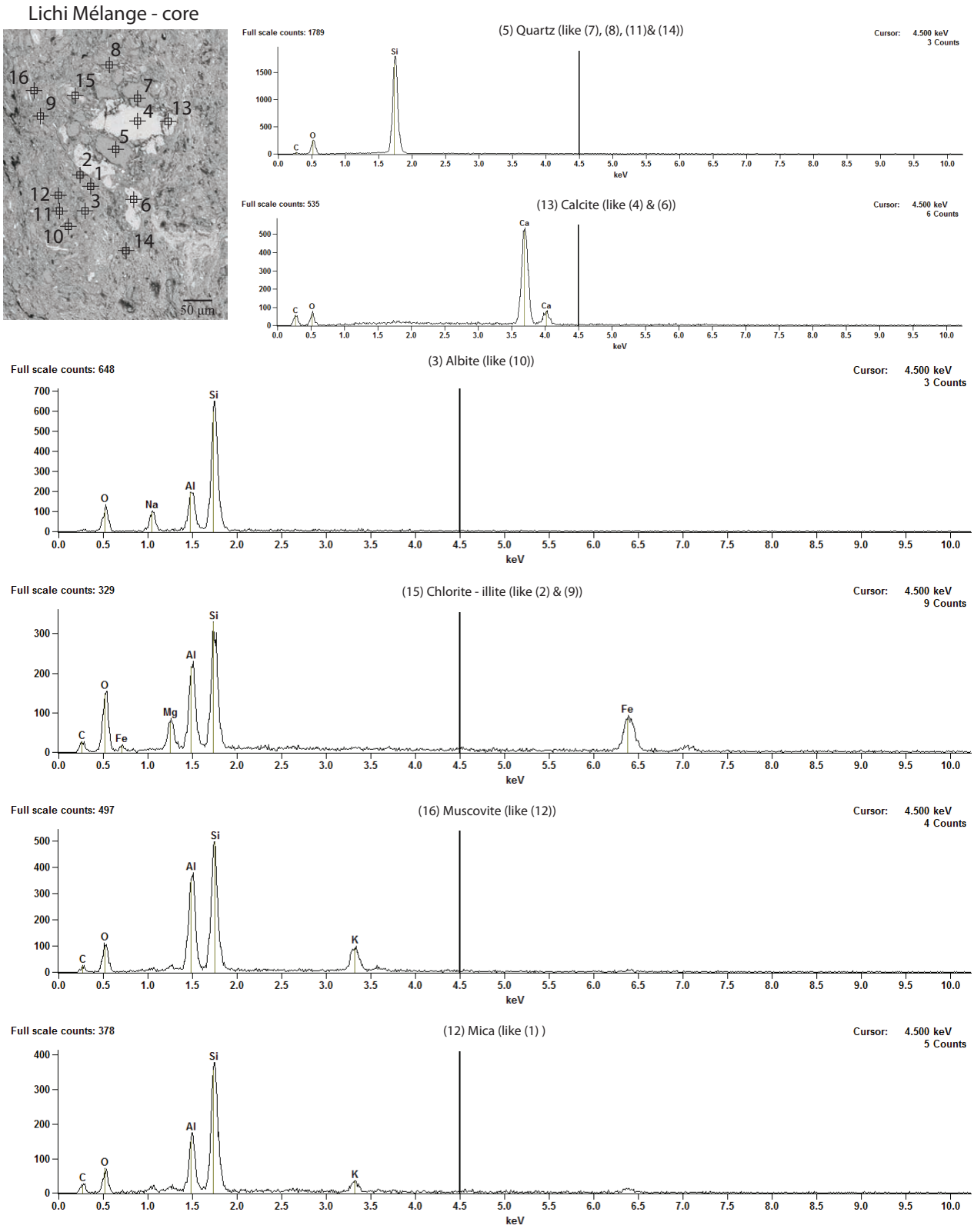


Figure S4: Representative EDS traces of grains inside the fault gouge, sample l2w46 (Lichi Mélange). For location of the analysis, see Figure 3.3h

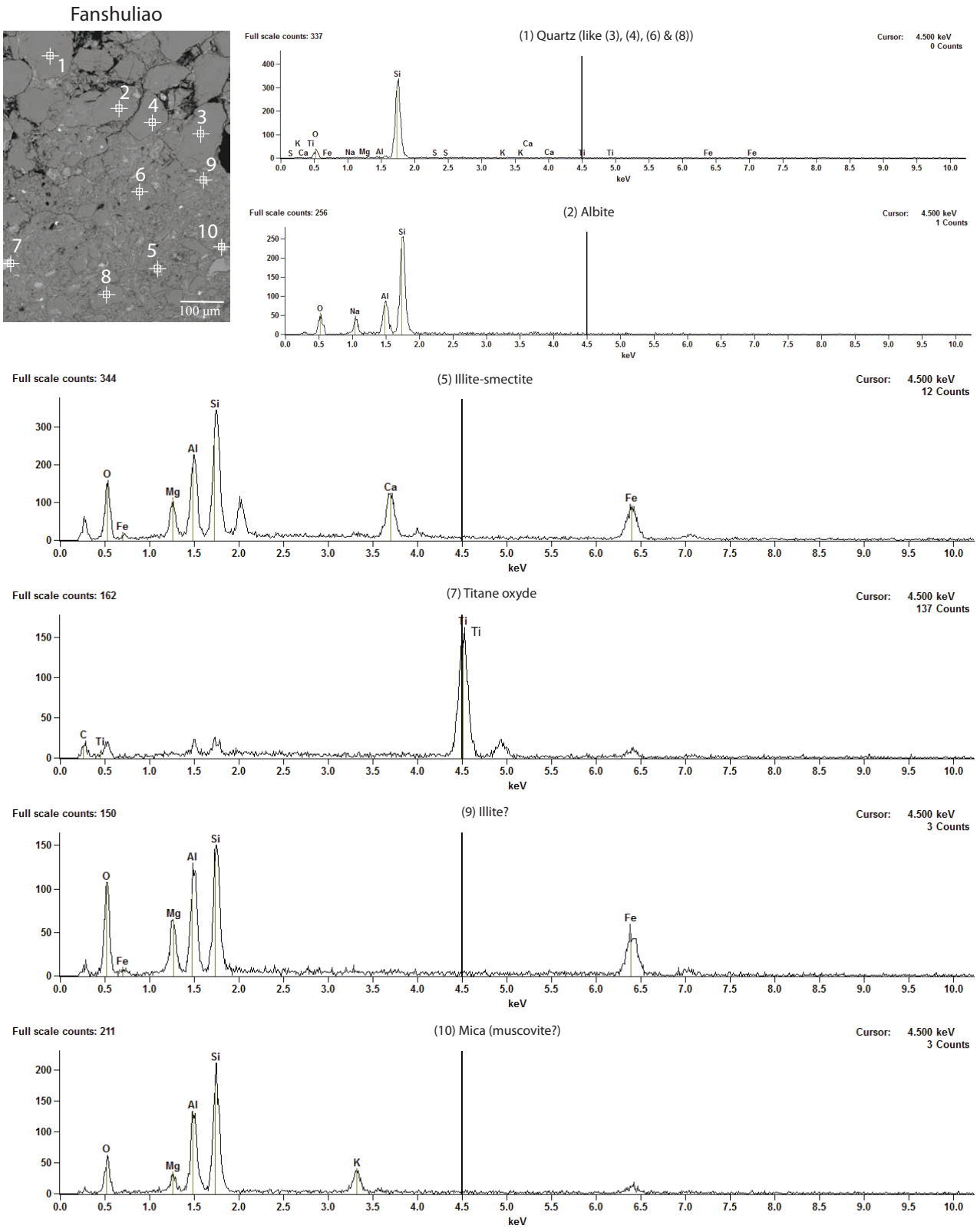


Figure S5: Representative EDS traces of grains inside the Fanshuliao formation, sample T12. For location of the analysis, see Figure 3.2d.

# References


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